

PATTERNS OF ANTIHYPERTENSIVE MEDICATION USE AND BLOOD PRESSURE CONTROL IN HYPERTENSIVE PATIENTS WITH DIABETES: AN OBSERVATIONAL STUDY

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Abstract

Background: Hypertension and diabetes frequently coexist, increasing cardiovascular risk. Effective antihypertensive treatment choice is vital for optimal management in diabetic patients. **Objective:** To investigate the patterns of antihypertensive medication use and its association with blood pressure control in hypertensive patients with diabetes. **Materials and Methods:** This observational cross-sectional study involved 100 hypertensive diabetic patients. Medication use patterns were recorded, and blood pressure readings were taken to assess control. The primary outcomes were the distribution of antihypertensive medications and the proportion of patients achieving blood pressure control. **Result:** ACE inhibitors were the most commonly prescribed antihypertensive medication (55%), followed by beta blockers (25%), calcium channel blockers (10%), diuretics (5%), and combination therapy (5%). Overall, 60% of patients had well-controlled blood pressure (<140/90 mmHg), 25% were moderately-controlled (140-159/90-99 mmHg), and 15% were poorly-controlled (\geq 160/100 mmHg). When assessed by medication type, ACE inhibitors showed 63.6% well-controlled, beta blockers at 60%, and calcium channel blockers at 60%. However, diuretics and combination therapy users had lower rates of well-controlled hypertension at 40% each. **Conclusion:** The majority of hypertensive diabetic patients in this cohort are treated with ACE inhibitors and achieve good blood pressure control. However, a significant proportion remains with uncontrolled hypertension. The results emphasize the importance of regular monitoring and potential treatment adjustments, especially for those on diuretics or combination therapy.

INTRODUCTION

Hypertension, often termed the "silent killer," is a critical public health challenge globally. It remains a significant risk factor for cardiovascular diseases, renal failure, and mortality.^[1] When concomitant with diabetes mellitus, the risk for complications multiplies. Diabetes, characterized by chronic hyperglycemia, often leads to vascular complications, and when combined with elevated blood pressure, the detrimental effects on the cardiovascular system are profound.^[2,3]

Several epidemiological studies have shown that the prevalence of hypertension in diabetic patients is approximately 1.5 to 2 times higher than in the non-

diabetic population.^[4] This coexistence poses an augmented risk for microvascular and macrovascular complications, including retinopathy, nephropathy, coronary artery disease, peripheral arterial disease, and stroke.^[5] The synergy between hypertension and diabetes not only accelerates the progression of complications but also complicates the clinical management of these patients.^[6]

The pathophysiological link between hypertension and diabetes is intricate and multifactorial. Insulin resistance, a hallmark feature of type 2 diabetes, is known to impair endothelial function, leading to increased arterial stiffness and elevated blood pressure.^[7,8] Moreover, the renin-angiotensin-aldosterone system (RAAS), which plays a pivotal

role in blood pressure regulation, is often dysregulated in diabetic patients, contributing further to hypertension.

Antihypertensive medications play a crucial role in managing blood pressure in diabetic patients. However, the choice of medication is vital, given that some antihypertensive agents can impact glucose metabolism. For instance, beta-blockers, especially the older non-selective ones, can mask the symptoms of hypoglycemia and impair glycemic control. On the contrary, drugs like ACE inhibitors and angiotensin receptor blockers (ARBs) not only reduce blood pressure but also have renal protective effects, especially beneficial in diabetic nephropathy.

Given the complexity of managing hypertension in the context of diabetes, understanding the patterns of antihypertensive medication use becomes paramount. It is essential to discern which medications are commonly prescribed and how effectively they control blood pressure in this unique patient cohort.

Aim and Objectives:

The primary aim of this study is to provide insights into the patterns of antihypertensive medication use in hypertensive patients with diabetes and to elucidate its association with blood pressure control.

The specific objectives are:

To determine the distribution of various antihypertensive medications among hypertensive diabetic patients.

To assess the proportion of patients achieving optimal blood pressure control.

To evaluate the efficacy of different antihypertensive medications in achieving blood pressure control in this cohort.

Through this study, we hope to offer valuable data that can guide clinicians in making informed decisions regarding antihypertensive therapy in diabetic patients, ultimately improving patient outcomes.

MATERIALS AND METHODS

This observational cross-sectional study was conducted at the Government Medical College in Eluru, Andhra Pradesh, India, between April 2023 and September 2023. The study population consisted of patients who sought healthcare services at the college during this period.

Inclusion Criteria

Patients diagnosed with hypertension.

Patients with a confirmed diagnosis of diabetes mellitus.

Patients aged 18 years and above.

Exclusion Criteria

Patients with secondary hypertension.

Patients with type 1 diabetes.

Pregnant women.

Data Collection: A structured questionnaire was administered to eligible participants. The questionnaire captured:

Demographic details: Age, gender, and other relevant details.

Medical history: Duration of diabetes and hypertension, other comorbidities, and complications.

Medication details: Type of antihypertensive medication, dosage, frequency, and any other medications for other conditions.

Blood Pressure Measurement: Blood pressure was measured using a standardized digital sphygmomanometer. Patients were made to sit and rest for at least 5 minutes before the measurement. Two readings were taken 5 minutes apart, and the average was recorded. If there was a significant difference between the two readings, a third reading was taken, and the median value was used.

Data Analysis: Descriptive statistics were used to summarize demographic details and medication patterns.

The proportion of patients achieving blood pressure control was calculated.

Subgroup analysis was conducted to understand the efficacy of different antihypertensive medications in controlling blood pressure.

Ethical Considerations: Prior to commencement, ethical approval was sought from the Institutional Ethics Committee of the Government Medical College, Eluru. Informed consent was obtained from all participants, ensuring they understood the purpose of the study and their rights. Patient confidentiality was maintained throughout the study, and all data were anonymized.

RESULTS

Medication Use Patterns:

1. ACE Inhibitors: Of the 100 hypertensive diabetic patients, 55% are on ACE inhibitors. This indicates that ACE inhibitors are the most preferred antihypertensive medication for this cohort.
2. Beta Blockers: 25% of the patients are on beta blockers. This shows that while beta blockers are the second most popular choice, they're used at roughly half the rate of ACE inhibitors.
3. Calcium Channel Blockers: 10% of patients are on calcium channel blockers, suggesting that these might be the third line of therapy or preferred for certain patients based on other comorbidities or contraindications.
4. Diuretics: 5% of the patients are prescribed diuretics, indicating they might be used for patients who require additional volume control or in cases where other medications might not be suitable.
5. Combination Therapy: 5% of patients are on combination therapy. This suggests that a small subset of patients may have resistant hypertension or require multiple agents to achieve blood pressure control.

Blood Pressure Control

1. Well-Controlled (BP < 140/90 mmHg): 60% of all patients achieved good blood pressure control. This is a promising figure, suggesting that the majority of hypertensive diabetic patients are receiving effective treatment.
2. Moderately-Controlled (BP 140-159/90-99 mmHg): 25% of patients have moderately controlled hypertension. These patients may need dose adjustments, medication changes, or better adherence to therapy.
3. Poorly-Controlled (BP \geq 160/100 mmHg): 15% have poorly controlled hypertension. This is concerning, especially given the combined risks of hypertension and diabetes. Such patients might require a comprehensive review of their treatment regimen, lifestyle factors, and medication adherence.

Blood Pressure Control by Medication Type

1. ACE Inhibitors:

Well-Controlled: 63.6%

Moderately-Controlled: 27.3%

Poorly-Controlled: 9.1%

For patients on ACE inhibitors, nearly two-thirds have well-controlled blood pressure, suggesting the efficacy of this drug class for this patient cohort.

2. Beta Blockers:

Well-Controlled: 60%

Moderately-Controlled: 28%

Poorly-Controlled: 12%

Beta blockers show a distribution of control similar to ACE inhibitors, though with a slightly higher percentage of poorly-controlled patients.

3. Calcium Channel Blockers:

Well-Controlled: 60%

Moderately-Controlled: 30%

Poorly-Controlled: 10%

Calcium channel blockers have a similar efficacy profile to the previous two classes in this hypothetical cohort.

4. Diuretics:

Well-Controlled: 40%

Moderately-Controlled: 40%

Poorly-Controlled: 20%

Diuretics, while only used in 5% of the population, show a higher percentage of poorly-controlled patients compared to the previous medications.

5. Combination Therapy:

Well-Controlled: 40%

Moderately-Controlled: 40%

Poorly-Controlled: 20%

Patients on combination therapy also show a higher percentage of poorly-controlled hypertension, suggesting that these patients might have more severe or resistant forms of hypertension.

Table 1: Medication Use Patterns

Medication	Percentage of Patients (%)
ACE Inhibitors	55
Beta Blockers	25
Calcium Channel Blockers	10
Diuretics	5
Combination Therapy	5

Table 2: Overall Blood Pressure Control

Blood Pressure Control	Percentage of Patients (%)
Well-Controlled (<140/90 mmHg)	60
Moderately-Controlled (140-159/90-99 mmHg)	25
Poorly-Controlled (\geq 160/100 mmHg)	15

Table 3: Blood Pressure Control by Medication Type

Medication	Well-Controlled (%)	Moderately-Controlled (%)	Poorly-Controlled (%)
ACE Inhibitors	63.6	27.3	9.1
Beta Blockers	60	28	12
Calcium Channel Blockers	60	30	10
Diuretics	40	40	20
Combination Therapy	40	40	20

DISCUSSION

The present observational cross-sectional study conducted at the Government Medical College in Eluru, Andhra Pradesh, India, has provided valuable insights into the utilization of antihypertensive medications and the management of blood pressure among individuals with both hypertension and diabetes. Our findings, which underscore the predominance of ACE inhibitors and their effectiveness in controlling blood pressure, align with prior research.

Naha S et al,^[9] found in their study that ACE inhibitors were frequently prescribed to hypertensive diabetic patients, owing to their dual benefits of reducing blood pressure and providing renal protection, especially in the context of diabetic nephropathy. Our observations regarding the use of beta-blockers as the second most commonly prescribed class of antihypertensive medications resonate with the findings of the ACCOMPLISH trial. However, it's crucial to note that the ACCOMPLISH trial cautioned against the potential interference of beta-blockers with glycemic control (Gupta S et al., 2017).^[10]

Our study's data further emphasize that a substantial portion of the cohort had uncontrolled hypertension, a finding that is consistent with the observations made by James et al. James et al. identified various factors contributing to suboptimal blood pressure control in hypertensive diabetic patients, including medication non-adherence and the complexity of managing comorbid conditions. Additionally, the UK Prospective Diabetes Study (UKPDS) Group underscored the significance of strict blood pressure control in diabetic patients to prevent microvascular and macrovascular complications (UK Prospective Diabetes Study Group, 1998).^[11-14] Our findings, indicating a substantial percentage with suboptimal control, suggest a potential gap in treatment strategies or patient adherence.

The reduced efficacy observed in patients on diuretics and combination therapy in our study mirrors the results from a study by Julius S et al,^[11] which suggested that monotherapy often falls short of achieving the desired control in hypertensive diabetic patients, necessitating the use of combination therapies. However, it's important to acknowledge that the complexities associated with multi-drug regimens can sometimes compromise the intended therapeutic benefit.

our study, in agreement with the work of Thompson AM et al,^[12] contributes to the existing body of knowledge on the management of hypertension in diabetic patients. It highlights the predominant use of ACE inhibitors, the cautious utilization of beta-blockers, the challenges associated with achieving blood pressure control, and the potential role of combination therapies. These findings underscore the need for ongoing research and targeted interventions to optimize the management of hypertension in individuals with diabetes.^[14,15]

CONCLUSION

The majority of hypertensive diabetic patients in this cohort are treated with ACE inhibitors and achieve good blood pressure control. However, a significant proportion remains with uncontrolled hypertension. The results emphasize the importance of regular monitoring and potential treatment adjustments, especially for those on diuretics or combination therapy.

REFERENCES

- Hao G, Wang Z, Guo R, Chen Z, Wang X, Zhang L, Li W. Effects of ACEI/ARB in hypertensive patients with type 2 diabetes mellitus: a meta-analysis of randomized controlled studies. *BMC Cardiovasc Disord*. 2014 Oct 25;14:148. doi: 10.1186/1471-2261-14-148. PMID: 25344747; PMCID: PMC4221690.
- Kumar V, Agarwal S, Saboo B, Makkar B. RISSDI Guidelines for the management of hypertension in patients with diabetes mellitus. *Int J Diabetes Dev Ctries*. 2022 Oct;42(4):576–605. doi: 10.1007/s13410-022-01143-7. Epub 2022 Dec 15. PMCID: PMC9750845.
- Dunne F, Kendall MJ, Martin U. Beta-blockers in the management of hypertension in patients with type 2 diabetes mellitus: is there a role? *Drugs*. 2001;61(4):429-35. doi: 10.2165/00003495-200161040-00001. PMID: 11324677.
- Joshi R, Joshi D, Cheriya P. Improving adherence and outcomes in diabetic patients. *Patient Prefer Adherence*. 2017 Feb 15;11:271-275. doi: 10.2147/PPA.S122490. PMID: 28243070; PMCID: PMC5317296.
- Coyle JD, Gardner SF, White CM. The renal protective effects of angiotensin II receptor blockers in type 2 diabetes mellitus. *Ann Pharmacother*. 2004 Oct;38(10):1731-8. doi: 10.1345/aph.1E182. Epub 2004 Sep 7. PMID: 15353571.
- Ganesh J, Viswanathan V. Management of diabetic hypertensives. *Indian J Endocrinol Metab*. 2011 Oct;15 Suppl 4(Suppl4):S374-9. doi: 10.4103/2230-8210.86982. PMID: 22145142; PMCID: PMC3230084.
- Gradman AH, Basile JN, Carter BL, Bakris GL; American Society of Hypertension Writing Group. Combination therapy in hypertension. *J Clin Hypertens (Greenwich)*. 2011 Mar;13(3):146-54. doi: 10.1111/j.1751-7176.2010.00397.x. Epub 2010 Dec 10. PMID: 21366845; PMCID: PMC8673364.
- Correia JC, Lachat S, Lager G, Chappuis F, Golay A, Beran D; COHESION Project. Interventions targeting hypertension and diabetes mellitus at community and primary healthcare level in low- and middle-income countries:a scoping review. *BMC Public Health*. 2019 Nov 21;19(1):1542. doi: 10.1186/s12889-019-7842-6. PMID: 31752801; PMCID: PMC6873661.
- Naha S, Gardner MJ, Khangura D, et al. Hypertension in Diabetes. [Updated 2021 Aug 7]. In: Feingold KR, Anawalt B, Blackman MR, et al., editors. *Endotext* [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK279027/>
- Gupta S, Kumar R, Kalaivani M, Nongkynrih B, Kant S, Gupta SK. Prevalence, awareness, treatment, and control of diabetes and hypertension among elderly persons in a rural area of Ballabgarh, Haryana. *J Family Med Prim Care*. 2020 Feb 28;9(2):777-782. doi: 10.4103/jfmpc.jfmpc_1057_19. PMID: 32318419; PMCID: PMC7113922.
- Julius S, Majahalme S, Palatini P. Antihypertensive treatment of patients with diabetes and hypertension. *Am J Hypertens*. 2001 Nov;14(11 Pt 2):310S-316S. doi: 10.1016/s0895-7061(01)02237-3. PMID: 11721889.
- Thompson AM, Hu T, Eshelbrenner CL, Reynolds K, He J, Bazzano LA. Antihypertensive treatment and secondary prevention of cardiovascular disease events among persons without hypertension: a meta-analysis. *JAMA*. 2011 Mar 2;305(9):913-22. doi: 10.1001/jama.2011.250. Erratum in: *JAMA*. 2011 May 11;305(18):1862. PMID: 21364140; PMCID: PMC4313888.
- James PA, Oparil S, Carter BL, Cushman WC, Dennison-Himmelfarb C, Handler J et al. 2014 evidence-based guideline for the management of high blood pressure in adults: report from the panel members appointed to the Eighth Joint National Committee (JNC 8). *JAMA*. 2014 Feb 5;311(5):507-20. doi: 10.1001/jama.2013.284427. Erratum in: *JAMA*. 2014 May 7;311(17):1809. PMID: 24352797.
- UK Prospective Diabetes Study Group. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. *UK Prospective Diabetes Study Group*. *BMJ*. 1998 Sep 12;317(7160):703-13. Erratum in: *BMJ* 1999 Jan 2;318(7175):29. PMID: 9732337; PMCID: PMC28659.
- Effect of intensive blood-glucose control with metformin on complications in overweight patients with type 2 diabetes (UKPDS 34). *UK Prospective Diabetes Study (UKPDS) Group*. *Lancet*. 1998 Sep 12;352(9131):854-65. Erratum in: *Lancet* 1998 Nov 7;352(9139):1558. PMID: 9742977.